METHODS OF INSTRUCTION IN THE
MATHEMATICS CURRICULUM FOR THE
ELEMENTARY SCHOOL

MATH 402, Section 1, Spring 2015 (3 credit hours)
Du Sable Hall 306 (Mathematics Education Lab)

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Course Web Site: http://www.math.niu.edu/courses/402

Course Goals

In this course, you will explore the teaching of mathematics, investigating both what to teach and how to teach it. The purpose of this course is to begin inquiry into mathematics teaching and learning that will guide you in your first teaching experiences and give you tools that will enable you to continue to inquire and learn as part of your work as a teacher. Current national reforms in mathematics education recommend that elementary teachers think in new ways about the content of their instruction (what to teach) and pedagogy (how to teach). This course is intended to launch you as a learner and teacher of mathematics in ways that correlate with these reforms.

In this course, you will explore how students learn mathematics and what is meant by deep understanding of mathematics. You will learn how to teach mathematics so that learners see relationships and connections among mathematics topics and between mathematics and other subjects. You also will learn how to develop a learning environment that promotes learning mathematics with understanding. Specifically, you will:

- Understand the content, methods, and materials necessary to teach mathematics for Grades K–6.
- Learn about research on children’s mathematical thinking and reform principles about teaching and learning mathematics.
- Learn how to build a learning environment that supports the teaching and learning of mathematics.
- Learn how to assess students’ mathematical thinking and plan instruction based on that assessment.
- Learn to make instructional decisions about the use of curricular materials, such as textbooks, other print resources, manipulatives, and technology in the teaching of elementary school mathematics.

This course aligns with principles of reflective inquiry.

Required Materials

- Math 402 Packet (download from the course web site when requested)
- Additional readings furnished or requested by the instructor

Course Requirements

Attendance, Participation, and Mathematical Disposition. Attendance is an essential part of your participation in this course. Your active participation in each session is vital to your learning as well as the learning of other students in the course. You are expected to attend all class sessions prepared and to be engaged as an active, collaborative participant during each class session, whether whole-class discussion, collaborative-group activity, or individual reflection is involved. Preparation for class sessions includes completion of assigned readings and tasks.
If you are unable to attend a particular class session, contact your instructor before class. You are responsible for contacting someone in the course to find out what transpired in your absence. Assignments are to be submitted on time even if you are absent. Assignments are due at the beginning of the class session. Late assignments are scored at a maximum of half credit. Make-up quizzes may be scheduled only in the event of documented illness or emergency. You are expected to adhere to the classroom and testing procedures set forth for this section of Math 402. You are expected to take the Final Exam for this course at the scheduled date and time.

Professional disposition is expected at all times. Learning mathematics extends beyond learning concepts, procedures, and their applications. It also includes developing a disposition toward mathematics and seeing mathematics as a powerful way for looking at situations (National Council of Teachers of Mathematics [NCTM], Curriculum and Evaluation Standards for School Mathematics, 1989, p. 233). Your mathematical disposition will be assessed using the recommendations of Standard 10 in the NCTM Curriculum and Evaluation Standards:

The assessment of students’ mathematical disposition should seek information about their—

- confidence in using mathematics to solve problems, to communicate ideas, and to reason;
- flexibility in exploring mathematical ideas and trying alternative methods in solving problems;
- willingness to persevere in mathematical tasks;
- interest, curiosity, and inventiveness in doing mathematics;
- inclination to monitor and reflect on their own thinking and performance;
- valuing the application of mathematics to situations arising in other disciplines and everyday experiences;
- appreciation of the role of mathematics in our culture and its value as a tool and as a language.

Mathematics Computation Test. You will take a basic skills test during the third week of the course. The test assesses your knowledge of whole numbers, fractions, decimals, ratio, percent, perimeter, and area. Download a practice copy from the course web page. A minimum score of 80% is required for a grade of C or better in the course.

Professional Collaboration, Practice, and Reflection: Mathematics Lesson Plan, Teaching, and Reflection on Teaching. Working individually or with a partner, and through collaboration with your clinical classroom teacher, in this core assignment you will plan and teach a problem-solving and reasoning-based lesson to students in your clinical setting. Your goal is for the lesson to develop concepts from a mathematics topic of choice that is consistent with the needs of the students. [Note: Lesson topics of coins, time, procedures, and practice are excluded.] You will engage students in problem solving and reasoning, and you will use appropriate supportive technology and/or instructional materials. Your lesson plan and teaching will conform to the spirit of the Principles and Standards for School Mathematics (NCTM, 2000), Principles to Actions: Ensuring Mathematical Success for All (NCTM, 2014), and the Common Core State Standards-Mathematics (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010). Following your teaching of the lesson, your clinical classroom teacher will complete an evaluation form on your teaching and will return it directly to the instructor. You will individually complete a reflective inquiry writing assignment in which you will consider changes to improve the lesson.

Professional Practice and Reflection: Student Interview Assignment. Working individually, in this core assignment you will use an informal assessment instrument to explore one elementary school student’s understanding of whole number or rational number operations. You will interview the student, and through reflection on the findings of the interview, you will describe and interpret the student’s understandings and misconceptions, and suggest a lesson to address a single misconception or knowledge gap that you observed. Keep in mind that the selected lesson is to be closely connected to your assessment observations.

Professional Collaboration, Practice, and Reflection: Curriculum Analysis Project. You will examine and analyze a mathematics lesson from an instructor-approved resource. You will write a one-paragraph summary of the lesson. Then you will analyze the lesson with respect to the Common Core State Standards-Mathematics (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010).

Exams. You will complete two exams during the semester as scheduled on the syllabus. You will have access to manipulative materials that are available in the Mathematics Education Lab during the quizzes.

Professional Resources: Children’s Literature Review. You will select a children’s book about mathematics from the set of books in the Mathematics Education Lab. You will write a review of the book based on given criteria and
prepare a five-minute presentation for sharing in small groups of classmates. You will receive detailed information on this assignment in class.

**Professional Resources: Illuminations Assignment.** You will select a lesson from the Illuminations web site, write a report based on given criteria, and prepare a five-minute presentation for sharing in small groups of classmates. You will receive detailed information on this assignment in class.

**Professional Practice and Reflection: Reflective Writing.** You will occasionally prepare short written core assignments during or outside of class that are related to the assigned readings and course activities. These assignments are designed to encourage you to reflect on and extend your thinking about particular topics. Reflective writing assigned as part of a class session must be completed during the class session on the day given.

**Resource Portfolio of Class Assignments and Materials.** You will keep a 3-ring binder that contains the syllabus, completed assignments, all course handouts, materials distributed by other class members, class notes and the Math 402 Packet. You will bring this binder to class on the assigned date.

**Final Exam.** The final exam will be comprehensive. You must take the final exam with your fellow classmates at the scheduled time, which is **Thursday, May 7, 2015, 8:00 – 9:50 am.** Location to be announced.

**Evaluation**

Final course grades will be determined according to point totals accumulated during the semester as noted in the table below and to the following requirements: In order to receive a final grade of “C” or higher for the course, a student must (1) complete all assignments; (2) complete the Mathematics Computation Test with a grade of 80% or higher,* and (3) complete all core assignments with a grade of “C” or higher.**

<table>
<thead>
<tr>
<th>Assignments and Tests</th>
<th>Percent of Total Grade</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance, Participation, and Mathematical Disposition</td>
<td>10%</td>
<td>20 points</td>
</tr>
<tr>
<td>Mathematics Computation Test*</td>
<td>0%*</td>
<td>0 points*</td>
</tr>
<tr>
<td>Mathematics Lesson Plan, Teaching, and Reflection on Teaching**</td>
<td>10%</td>
<td>20 points</td>
</tr>
<tr>
<td>Student Interview Assignment**</td>
<td>15%</td>
<td>30 points</td>
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<tr>
<td>Curriculum Analysis Project</td>
<td>5%</td>
<td>10 points</td>
</tr>
<tr>
<td>Quizzes</td>
<td>20%</td>
<td>40 points</td>
</tr>
<tr>
<td>Children’s Literature Review</td>
<td>4%</td>
<td>8 points</td>
</tr>
<tr>
<td>Illuminations Assignment</td>
<td>4%</td>
<td>8 points</td>
</tr>
<tr>
<td>Reflective Writing**</td>
<td>6%</td>
<td>12 points</td>
</tr>
<tr>
<td>Resource Portfolio of Class Assignments and Materials</td>
<td>1%</td>
<td>2 points</td>
</tr>
<tr>
<td>Final exam</td>
<td>25%</td>
<td>50 points</td>
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</tbody>
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**Grading Scale**

A 90% - 100 % of point total  
B 80% - 89.9 % of point total  
C 70% - 79.9 % of point total  
D 60% - 69.9% of point total  
F Below 60%

**Performance Standards for Student Work**

A Fully achieves the purpose of assignments. Insightfully interprets assignments, extends beyond assignments, or raises thought provoking questions. Shows clear understanding of concepts. Communicates effectively.

B Substantially completes purposes of assignments. Displays clear understanding of concepts, even though some less important ideas may be missing. Communicates successfully.

C Purposes of assignments not fully achieved; elaboration needed. Displays understanding of major concepts, even though some less important ideas may be missing. Limits communication to some important ideas. Results may be incomplete or not clearly presented.

D Important purposes of assignments not achieved; work may need redirection. Assumptions about the purposes may be flawed. Gaps in conceptual understanding are evident. Approach to assignments may lead away from successful completion. Results may be incomplete. Communication attempted.

Semester Schedule

Week 1: January 12, 14
Due January 14: Reflective Writing I
January 14: Bring your textbook and Field Experience Guide to class
Chapter 1 Teaching Mathematics in the 21st Century
Chapter 2 Exploring What It Means to Know and Do Mathematics
What is involved in teaching elementary school mathematics? What are the recent reforms in mathematics education? What does it mean to know and do mathematics? What does it mean when we say that each person constructs his/her own knowledge? What does it mean to understand mathematics? What are key dimensions of a learning environment that help students understand mathematics?

Week 2: January 21
January 19: Martin Luther King Day: No classes at NIU
January 21: Bring to class your completed copy of the Practice Mathematics Computation Test
Chapter 8 Developing Early Number Concepts and Number Sense
What is number sense? What is a number? What is conservation of number? What is a numeral? What kind of tasks can help students connect numbers to real-world situations? What kinds of tasks can help students use early number relationships to develop early mental computation?

Week 3: January 26, 28
January 26: Mathematics Computation Test
January 26: Bring to class your Math 402 Course Packet to class (download from course web site)
Due January 28: Reflective Writing II
Chapter 9 Developing Meanings for the Operations
Chapter 10 Helping Children Master the Basic Facts
How do children learn addition and subtraction? What are the types of addition and subtraction problems? What solution strategies do children use to solve these types of problems? How does students’ choice of solution strategies facilitate assessment of children’s mathematical thinking? How is this assessment related to teaching? How do children think about multiplication and division? What are the types of multiplication and division problems? What solution strategies do children use to solve these types of problems? What are basic facts? What is mastery of basic facts? What is an efficient strategy? When is it appropriate to use drill and how can it help? What are some reasons to avoid using timed tests as a means of learning basic facts? What are some ways to help older children who have not learned basic facts?

Week 4: February 2, 4
Due February 4: Professional Resources: Children’s Literature Review
Chapter 11 Developing Whole-Number Place Value
Chapter 12 Developing Strategies for Whole-Number Computation
What is place value? What is the importance of place value in whole number operations? What are equivalent representations? How would you describe good place-value number sense? How can we elicit and discuss the various methods students use to solve problems?

Week 5: February 9, 11
Due February 9: Professional Resources: Illuminations assignment
February 11: Exam on Place Value
Due February 11: Prepared fraction circles (following directions given in class)
Due February 11: Bring 3 copies of p. 236 (1-cm Square/Diagonal Grid–40) in the Field Experience Guide
Chapter 15 Developing Fraction Concepts
Chapter 16 Developing Strategies for Fractions Computation
What is a fraction? How do children learn fractions? What are the possible representations to use with fractions? What are the advantages and limitations of particular representations? How do you gather information about students’ understandings of fractions?
Week 6: February 16, 18
Due February 16: Bring 3 copies of Field Experience Guide p. 223 (10 × 10 Grids–27)
Chapter 16 Developing Strategies for Fraction Computation
Chapter 17 Developing Concepts of Decimals and Percents
What should be emphasized in order for children to develop good number sense with decimals? What is the relationship between fractions and decimals? What is the relationship between decimals and percents?

Week 7: February 23, 25
February 25: Exam on Fraction Operations
Chapter 4 Planning in the Problem-Based Classroom
Chapter 5 Building Assessment into Instruction
Chapter 6 Teaching Mathematics Equitably to All Children
What is the teacher’s purpose or agenda before, during, and after a lesson? How do we reach all children when we teach mathematics?
How do we assess children’s mathematical thinking? How do we gather information from students about what they understand? What do we do with the information we gather? How is assessment related to teaching?

Week 8: March 2, 4
Due March 4: Interview/Assessment Report and Reflection
Chapter 14 Algebraic Thinking: Generalizations, Patterns, and Functions
What is algebraic reasoning? What are beginning algebra concepts? What is the role of patterns in learning algebra? How does algebra relate to the real world?

Spring Break: March 9 – 13

Week 9—First Clinical Week: March 16 – 20
- The decision about the lesson you will teach during the clinical week in April must be made with your clinical classroom teacher during the First Clinical Week. No exceptions. You must be ready to work on the lesson plan during class at NIU next week. (Note: Failure to comply with this request will result in an immediate disposition alert.)
- Make one copy of the lesson, including teacher pages and applicable worksheets, for class on Monday, March 23. (No exceptions, Failure to comply with this request will result in an immediate disposition alert.)
- Download Lesson Plan Template for class on Monday, March 23

Week 10: March 23, 25
Due March 23: One copy of the lesson you will teach, including all teacher pages, and applicable worksheets
Due March 23: Downloaded Lesson Plan Template will be used during class sessions this week.
Chapter 20 Geometric Thinking and Geometric Concepts
What does it mean to think geometrically? What are the van Hiele levels of geometric learning and how are they useful? How can we assess students’ spatial sense and geometric reasoning?

Week 11: March 30, April 1
Due March 30: Good Draft of Lesson Plan (No exceptions. Failure to comply will result in an immediate disposition alert.)
Chapter 19 Developing Measurement Concepts
Chapter 7 Using Technology to Teach Mathematics
What concepts of measurement should elementary students understand? How do children learn measurement concepts? What is the role of estimation in learning measurement?
What are the benefits of using calculators in mathematics instruction? How do you address common misconceptions about calculator use? How might computers be used as a tool in mathematics instruction? What are some good criteria for selecting and using software?

Week 12: April 6, 8
Due April 6: Final Lesson Plan (No exceptions: The final lesson plan must be scored by your instructor and returned to you on April 8. Failure to comply will result in an immediate disposition alert.)
Due April 8: Reflective Writing III
Chapter 18 Proportional Reasoning
Week 13—Second Clinical Week: April 13 – 17
• Teach mathematics lesson plan previously approved by the instructor
• Write your Reflection on Teaching for the lesson taught during your clinical experience
• Observation report from the clinical classroom teacher is due immediately after teaching the lesson
  (Send to the instructor via U. S. mail in the provided envelope.)

Week 14: April 20, 22
Due April 22: Reflection on Teaching for the lesson taught during your clinical experience
Chapter 21 Developing Concepts of Data Analysis
Chapter 22 Exploring Concepts of Probability

Week 15: April 27, 29
Due April 27: Resource Portfolio
Due April 27: Curriculum Evaluation Project
Preparation for the Final Exam

Final Exam: Thursday, May 7, 2015, 8:00 – 9:50 am. Location to be announced.

Note: Changes and adjustments may be made to this syllabus when judged appropriate by the instructor. Such changes, should they occur, will be announced in class.

Qualified Students with Disabilities
Northern Illinois University abides by Section 504 of the Rehabilitation Act of 1973, which mandates reasonable accommodations be provided for qualified students with disabilities. If you need an accommodation for this class, please contact the Disability Resource Center as soon as possible. If you have a disability and may require some type of instructional and/or exam accommodation, please contact your instructor privately as soon as possible in the semester so the instructor can assist you in achieving your learning goals in this course. The DRC coordinates accommodations for students with disabilities, the designated office on campus to provide service and administer exams with accommodations for students with disabilities. The DRC is located on the 4th floor of the NIU Health Services Building, and can be reached at 815-753-1303 (V) or drc@niu.edu.

Academic Conduct
Academic honesty and mutual respect (among students and between instructor and students) are expected in this course. Academic misconduct, as defined by the Student Judicial Code, will not be tolerated. Professional disposition is expected at all times.

General Classroom Etiquette
• Please set your cell phone to vibrate during class and only use your cell phone when it is a true emergency.
• No phones, iPads, and other electronic devices can be used for any in-class work including exams and reflections, except when requested by the instructor.
• Arrive on time, come prepared for class, stay to the end of class, and be in the classroom for the entire session, unless you have an emergency situation.
• Only students who are registered for this course should attend class sessions.
• Give your attention to the presenters during class, whoever they may be.
• Professional disposition is expected at all times.

Course Lab Fee
A lab fee charged for enrollment in this course is used to replace and update materials pertaining to instruction of the course and research on instruction of the course.